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which was executed for St. Peter's Church, Rosendale. In fact, good as our previous issues have been, we feel safe in saying that our April issue will be much better.

It is quite evident that times are improving, and as soon as the weather gets better there will be a more active demand for workers in wood than there has been for some years. The severity of the winter has compelled carpenters and joiners to remain idle a greater length of time this season than last, and the present extremely dull period with these trades is due more to the inclemency of the weather than to the scarcity of work. The increased purchasing power of money, bonds, etc., has induced thousands of persons of small property throughout the country towns to build new houses. In the West especially some country villages have doubled their house accommodation during the past five years.

The cabinet-maker will find his business improve along with that of the carpenter, for new houses will require new furnishings, and thus the ball is kept rolling.

Owing, no doubt, to the fact that many thousand miles of road-bed have been improved and steel rails laid within the last few years, less new cars have been required, as the improvements have tended to preserve the rolling stock from wear much longer than formerly, and thus the trade is kept dull. There are visible signs of improvement, however, and we trust that before midsummer the trade will revive to something like its former activity.

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Practical Carpentry.

THE usual definition of an ellipse is, that it is "a figure bounded by a regular curve, generated from two foci." This definition is best explained by the use of string and pencil. In Fig. 1, Plate 22, draw the line A B, representing the length of the figure, and at right angles to it draw the line C D, representing its width. Take the distance A E, or one half of the length, and with C as a centre strike the arc F H G. The points at which this arc cuts the major axis, or, in other words, F and G, will be the foci. Drive a pin in each, and also a third one in C. Around these three pins tie a string. Remove the third pin and substitute a pencil. By moving the pencil around the two foci, keeping the string stretched all the time, a regular curve will be produced, which is an ellipse.

Fig. 2 shows a method of drawing an ellipse with a trammel. L M is the major or largest diameter, and P T the minor or short diameter; place the trammel with its centre over the intersection of the two diameters as shown; make the distance on the rod, from the pencil R to the pin F, equal to P S, and from R to the pin C equal to S L; now, let the pins C F move through the grooves, and the pencil will then mark the outline of the ellipse.

The ellipse may also be projected as follows: Take a rod or strip of paper, as shown in Fig. 3, lay out the diameters A B and C D, and mark on the rod or paper O K, equal to L D; also O N, equal to L B. Now move the strip directly on the end adjoining the edge upon which you marked K N. The curve can then be traced through the points so found.

On Fig. 4 is shown a method of finding the exact shape of newel cap on any required mitre with a given form of hand-rail. Suppose S to be the given form of hand-rail; O F N the plan of mitre; T L the diameter of newel cap. Draw the line K G at right angles to T L, from E to N, parallel to G F; draw as many ordinates as may be deemed sufficient, cutting the mitre line F N; with J as centre, and J F as radius, draw F R, then 2, 3, etc. Take E G, and place it at J K and R 6; place 1 5 at 3 8, etc. The line traced through these points at H shows the form of the required newel cap. Should the mitre, extending from edge of cap, equal half the width of the rail, the shape of the cap may be exactly like that of the hand-rail.

The direction of any joint in any ellipse may be found as follows: Find the focii O O, Fig. 5, as explained in Fig. 1. Let V be the point at which the joint is required; draw from O O through V, O S, and O R; mark V S and V R equal. With any distance greater than one half between R and S, with R and S as centres, mark the arcs intersecting at T; draw the line T F, and this will be the point sought. So by biseting the angle S V O, we should find a tangent to the ellipse at the point V. This is a very useful problem, and should be studied until it is thoroughly understood by the student, as it will be found of great value in learning the art of stair-building.

A method of producing an approximate ellipse, and one in quite common use among builders, by reason of its convenience for large figures, is shown in Fig. 6. Lay off the length of the required figure, as shown by A B, and the width as shown by C D. Construct a parallelogram that shall have its sides tangent to the figure at the points of its length and width, all as shown by E F G H. Subdivide one half of the end of the parallelogram into any convenient number of equal parts, as shown by A E, and one half of its side in the same manner, as shown by E D. Connect these two sets of points by intersecting lines in the manner shown in the engraving. Repeat the operation for each of the other corners of the parallelogram. A line traced through the inner set of intersections will be a very close approximation to an ellipse.

An ellipse may be drawn by the intersection of lines, as shown in Fig. 7. Draw A B, and bisect it at right angles with C D. With the point of intersection K as a centre, and with one half of the longer diameter of the required figure for a radius, strike the circle A C B D. From the same centre, and with one half of the shorter diameter for a radius, strike the circle E F G H. Divide each of these circles into the same number of equal parts, as shown by the small figures. From the several points in the outer circle drop lines vertically, and from the points in the inner circle draw lines horizontally, intersecting each other as shown. A line traced through these points of intersection will form an ellipse.

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The Sectorian System of Hand-Railing.

THIRD PAPER.

ON plate 18 are four examples of plans, varying in size from six to twelve-inch cylinders, or from centre to centre of rail on each side of cylinder, with their wreaths drawn from tangents taken from the sector, with spring and plumb bevels to each.

In every case these bevels are the same, when the pitch-board is the same for different flights. No. 5 is a plan of a winding stairs, with cylinder twenty-four inches. This plan is in very common use, hence the need of giving an example on this system, showing the simplicity to which the whole subject is brought. For instance, required the wreath for a circular stairs, the cylinder being two feet, and eight winders in the semicircle. Suppose the space to be eight feet wide, having three feet length of tread on each side of cylinder. First draw the chord line and get the centre; draw the semicircle of rail, which will be twenty-four and a half inches to centres; next draw tangents, as at No. 5, cutting centre of rail at right angles on each side; then, from the centre of chord line A, draw lines cutting through angle of tangents E and C; then draw through back of cylinder at a right angle with chord line. These lines give the face of the risers of four winders in the cylinder. Now divide the spaces, and draw as before, and you have all the winders. Now unfold the sector to a level plane—cover the face with white paper pinned on at the four corners; draw a base line across the face; then on this line set off from the joint, each way, the distance from D to E (Fig. 5), and from E to F—E being the joint, raise lines from those points, D and F. Now get the height of four risers, which in this case is twenty-eight inches, and half of the wreath; now draw the angle across the face of the sector from D to E (No. 5). Now fold the sector to a right angle, and secure it in that position by the wire brace across the top end; now turn the sector and let it rest on its two edges, with the angle upwards; now apply the tangent bevel across the angle, with each blade ranging with angle line of the rake of the winders, which give the tangent as at A, B, C, No. 6.

The length from A to B, No. 6, is the height from D to E, No. 5, on the rake line. While the tangent bevel is in position across the sector, take the spring and plumb bevel and apply one blade on the face of the sector, and the other against and at right angles with the blade of the tangent bevel: this gives the spring and plumb bevel, which in this case is the same, and gives the twist of the wreath from A to C, No. 6.

After the length of the tangents, A, B, C, are procured, as shown by dotted lines, draw down at right angles with tangent lines on each side, also plumb line from B to D, intersecting at D, from which point describe the wreath from A to C. If the piece is too long for the dividers, stick a pin at A and C; then take a bevel with each leg as long as wreath piece, with inner edges straight; then from the chord line A, C at the centre, set up the distance from H to I, No. 5. At this point place the angle of the bevel, each leg touching the pins inside and with pencil in the angle, and pressing the legs against the pins, describe the piece from A to C.

The spring and plumb bevels give the convex and concave twist, to which apply the falling moulds on both sides, which in this case is the width of the thickness of the rail, and perfectly straight. The spring and plumb bevel having given the horizontal line at each section of wreath, the centre of the moulds must be placed at these centres and drawn close to the surface and pinned. Tin is best for these moulds, as the best preventive from kerfing too deep, as might be the case if pasteboard be used. After kerfing, remove moulds, and work off to lines, and you have top and bottom face of rail. The same face and falling moulds will answer for both pieces of wreath, as they are both the same shape.

In these notes I have endeavored to be as plain as possible, so that none may complain of abstruse technicalities.

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Isometric Projection.

To make the "scale of tangents" as shown in Fig. 8, plate 15, proceed as follows: Let *a b c d* be the side of a square. From *a*, with radius *a b*, describe the arc *b c*. Divide this into nine equal parts, and through these draw, from the point *a*, lines cutting the sides *c d*, *d b*. Divide each of these parts into two equal divisions, and draw lines as before. The line *b d* will form a "scale of tangents to 45°," ending at the point *d* at 45°. Next construct an isometrical cube, as

Plate 22

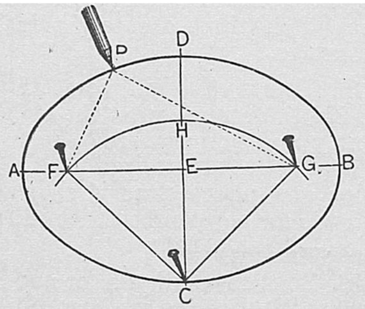


Fig. 1.

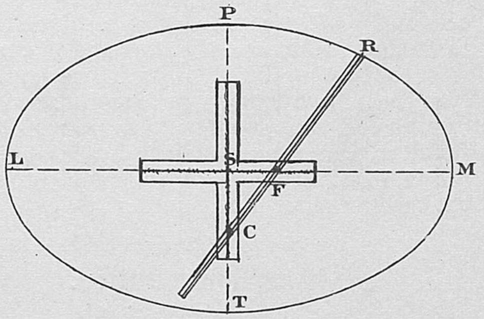


Fig. 2.

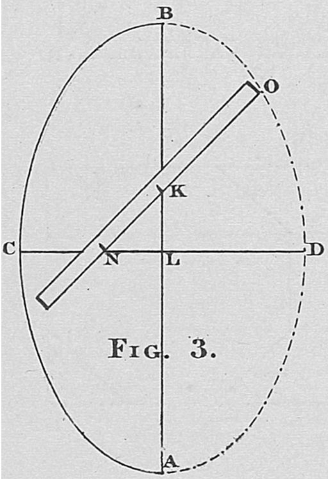


Fig. 3.

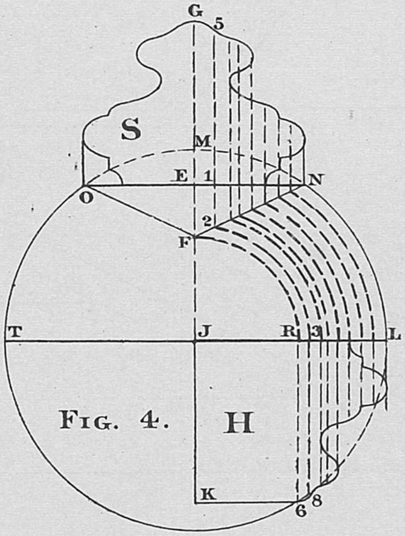


Fig. 4.

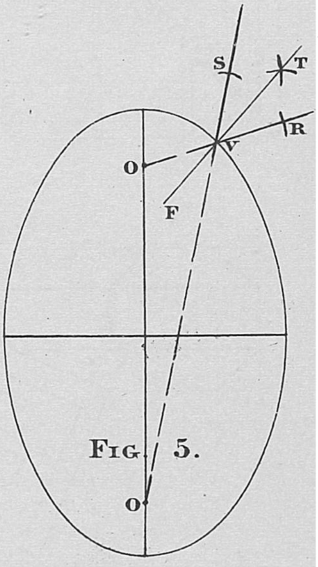
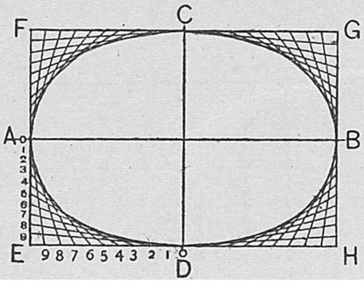


Fig. 5.

Fig. 6



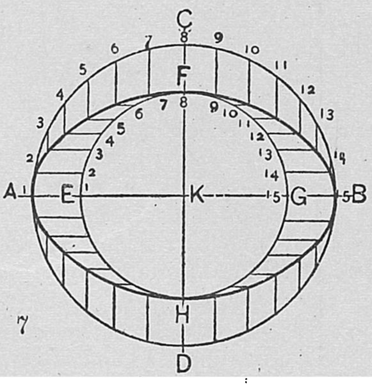


Fig. 7

PRACTICAL CARPENTRY.